THAT WHICH IS CLAIMED IS:

A semiconductor device comprising:

a superlattice comprising a plurality of stacked groups of layers; and

regions for causing transport of charge carriers through said superlattice in a parallel direction relative to the stacked groups of layers;

each group of layers of said superlattice comprising a plurality of stacked base semiconductor monolayers defining a base semiconductor portion and an energy band-modifying layer thereon;

said energy-band modifying layer comprising at least one non-semiconductor monolayer constrained within a crystal lattice of adjacent base semiconductor portions so that said superlattice has a higher charge carrier mobility in the parallel direction than would otherwise be present.

- 2. A semiconductor device according to Claim 1 wherein said superlattice has a common energy band structure therein.
- 3. A semiconductor device according to Claim 1 wherein the charge carriers having the higher mobility comprise at least one of electrons and holes.
- 4. A semiconductor device according to Claim 1 wherein each base semiconductor portion comprises silicon.
- 5. A semiconductor device according to Claim 1 wherein each energy band-modifying layer comprises oxygen.

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- 6. A semiconductor device according to Claim 1 wherein each energy band-modifying layer is a single monolayer thick.
- 7. A semiconductor device according to Claim 1 wherein each base semiconductor portion is less than eight monolayers thick.
- 8. A semiconductor device according to Claim 1 wherein each base semiconductor portion is two to six monolayers thick.
- 9. A semiconductor device according to Claim 1 wherein said superlattice further has a substantially direct energy bandgap.
- 10. A semiconductor device according to Claim 1 wherein said superlattice further comprises a base semiconductor cap layer on an uppermost group of layers.
- 11. A semiconductor device according to Claim 1 wherein all of said base semiconductor portions are a same number of monolayers thick.
- 12. A semiconductor device according to Claim 1 wherein at least some of said base semiconductor portions are a different number of monolayers thick.
- 13. A semiconductor device according to Claim 1 wherein all of said base semiconductor portions are a different number of monolayers thick.

- 14. A semiconductor device according to Claim 1 wherein each non-semiconductor monolayer is thermally stable through deposition of a next layer.
- 15. A semiconductor device according to Claim 1 wherein each base semiconductor portion comprises a base semiconductor selected from the group consisting of Group IV semiconductors, Group III-V semiconductors, and Group III-VI semiconductors.
- 16. A semiconductor device according to Claim 1 wherein each energy band-modifying layer comprises a non-semiconductor selected from the group consisting of oxygen, nitrogen, fluorine, and carbon-oxygen.
- 17. A semiconductor device according to Claim 1 further comprising a substrate adjacent said superlattice.
- 18. A semiconductor device according to Claim 1 wherein the higher charge carrier mobility results from a lower conductivity effective mass for the charge carriers in the parallel direction than would otherwise be present.
- 19. A semiconductor device according to Claim 18 wherein the lower conductivity effective mass is less than two-thirds the conductivity effective mass that would otherwise occur.
- 20. A semiconductor device according to Claim 1 wherein said superlattice further comprises at least one type of conductivity dopant therein.

21. A semiconductor device comprising:

a superlattice comprising a plurality of stacked groups of layers; and

regions for causing transport of charge carriers through said superlattice in a parallel direction relative to the stacked groups of layers;

each group of layers of said superlattice comprising a plurality of stacked silicon monolayers defining a silicon portion and an energy band-modifying layer thereon;

said energy-band modifying layer comprising at least one oxygen monolayer constrained within a crystal lattice of adjacent silicon portions so that said superlattice has a higher charge carrier mobility in the parallel direction than would otherwise be present.

- 22. A semiconductor device according to Claim 21 wherein said superlattice has a common energy band structure therein.
- 23. A semiconductor device according to Claim 21 wherein the charge carriers having the higher mobility comprise at least one of electrons and holes.
- 24. A semiconductor device according to Claim 21 wherein each energy band-modifying layer is a single monolayer thick.
- 25. A semiconductor device according to Claim 21 wherein each silicon portion is less than eight monolayers thick.

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- 26. A semiconductor device according to Claim 21 wherein each silicon portion is two to six monolayers thick.
- 27. A semiconductor device according to Claim 21 wherein said superlattice further has a substantially direct energy bandgap.
- 28. A semiconductor device according to Claim 21 wherein said superlattice further comprises a silicon cap layer on an uppermost group of layers.
- 29. A semiconductor device according to Claim 21 wherein all of said silicon portions are a same number of atomic layers thick.
- 30. A semiconductor device according to Claim 21 wherein at least some of said silicon portions are a different number of monolayers thick.
- 31. A semiconductor device according to Claim 21 wherein all of said silicon portions are a different number of monolayers thick.
- 32. A semiconductor device according to Claim 21 further comprising a substrate adjacent said superlattice.
- 33. A semiconductor device according to Claim 21 wherein the higher charge carrier mobility results from a lower conductivity effective mass in the parallel direction than would otherwise be present.

- 34. A semiconductor device according to Claim 21 wherein said superlattice further comprises at least one type of conductivity dopant therein.
- 35. A semiconductor device comprising:

 a superlattice comprising a plurality of stacked
 groups of layers; and

regions adjacent said superlattice for causing transport of charge carriers through said superlattice in a parallel direction relative to the stacked groups of layers;

each group of layers of said superlattice comprising less than eight stacked base semiconductor monolayers defining a base semiconductor portion and an energy band-modifying layer thereon;

said energy-band modifying layer comprising a single non-semiconductor monolayer constrained within a crystal lattice of adjacent base semiconductor portions so that said superlattice has a higher charge carrier mobility in the parallel direction than would otherwise be present.

- 36. A semiconductor device according to Claim 35 wherein said superlattice has a common energy band structure therein.
- 37. A semiconductor device according to Claim 35 wherein the charge carriers having the higher mobility comprise at least one of electrons and holes.

- 38. A semiconductor device according to Claim 35 wherein said superlattice further has a substantially direct energy bandgap.
- 39. A semiconductor device according to Claim 35 wherein said superlattice further comprises a base semiconductor cap layer on an uppermost group of layers.
- 40. A semiconductor device according to Claim 35 wherein all of said base semiconductor portions are a same number of monolayers thick.
- 41. A semiconductor device according to Claim 35 wherein at least some of said base semiconductor portions are a different number of monolayers thick.
- 42. A semiconductor device according to Claim 35 wherein all of said base semiconductor portions are a different number of monolayers thick.
- 43. A semiconductor device according to Claim 35 further comprising a substrate adjacent said superlattice.
- 44. A semiconductor device according to Claim 35 wherein the higher charge carrier mobility results from a lower conductivity effective mass in the parallel direction than would otherwise be present.
- 45. A semiconductor device according to Claim 35 wherein said superlattice further comprises at least one type of conductivity dopant therein.

46. A semiconductor device comprising:

a superlattice comprising a plurality of stacked groups of layers; and

regions for causing transport of charge carriers through said superlattice in a parallel direction relative to the stacked groups of layers;

each group of layers of said superlattice comprising less than eight stacked silicon monolayers defining a silicon portion and an energy band-modifying layer thereon;

said energy-band modifying layer comprising a single oxygen monolayer constrained within a crystal lattice of adjacent silicon portions.

- 47. A semiconductor device according to Claim 46 wherein said superlattice further comprises a base semiconductor cap layer on an uppermost group of layers.
- 48. A semiconductor device according to Claim 46 wherein all of said base semiconductor portions are a same number of monolayers thick.
- 49. A semiconductor device according to Claim 46 wherein at least some of said base semiconductor portions are a different number of monolayers thick.
- 50. A semiconductor device according to Claim 46 wherein all of said base semiconductor portions are a different number of monolayers thick.
- 51. A semiconductor device according to Claim 46 further comprising a substrate adjacent said superlattice.

- 52. A semiconductor device according to Claim 46 wherein said superlattice further comprises at least one type of conductivity dopant therein.
 - 53. A semiconductor device comprising:

a superlattice comprising a plurality of stacked groups of layers; and

regions for causing transport of charge carriers through said superlattice in a parallel direction relative to the stacked groups of layers;

each group of layers of said superlattice comprising a plurality of stacked base semiconductor monolayers defining a base semiconductor portion and an energy band-modifying layer thereon;

said energy-band modifying layer comprising at least one non-semiconductor monolayer constrained within a crystal lattice of adjacent base semiconductor portions so that said superlattice has a lower conductivity effective mass in the parallel direction than would otherwise be present.

- 54. A semiconductor device according to Claim 53 wherein said superlattice has a common energy band structure therein.
- 55. A semiconductor device according to Claim 53 wherein the charge carriers having the lower conductivity effective mass comprise at least one of electrons and holes.

- 56. A semiconductor device according to Claim 53 wherein each base semiconductor portion comprises silicon.
- 57. A semiconductor device according to Claim 53 wherein each energy band-modifying layer comprises oxygen.
- 58. A semiconductor device according to Claim 53 wherein each energy band-modifying layer is a single monolayer thick.
- 59. A semiconductor device according to Claim 53 wherein each base semiconductor portion is less than eight monolayers thick.
- 60. A semiconductor device according to Claim 53 wherein each base semiconductor portion is two to six monolayers thick.
- 61. A semiconductor device according to Claim 53 wherein said superlattice further has a substantially direct energy bandgap.
- 62. A semiconductor device according to Claim 53 wherein said superlattice further comprises a base semiconductor cap layer on an uppermost group of layers.
- 63. A semiconductor device according to Claim 53 wherein all of said base semiconductor portions are a same number of monolayers thick.

- 64. A semiconductor device according to Claim 53 wherein at least some of said base semiconductor portions are a different number of monolayers thick.
- 65. A semiconductor device according to Claim 53 wherein all of said base semiconductor portions are a different number of monolayers thick.
- 66. A semiconductor device according to Claim 53 wherein each non-semiconductor monolayer is thermally stable through deposition of a next layer.
- 67. A semiconductor device according to Claim 53 wherein each base semiconductor portion comprises a base semiconductor selected from the group consisting of Group IV semiconductors, Group III-V semiconductors, and Group III-VI semiconductors.
- 68. A semiconductor device according to Claim 53 wherein each energy band-modifying layer comprises a non-semiconductor selected from the group consisting of oxygen, nitrogen, fluorine, and carbon-oxygen.
- 69. A semiconductor device according to Claim 53 further comprising a substrate adjacent said superlattice.
- 70. A semiconductor device according to Claim 53 wherein the lower conductivity effective mass is less than two-thirds the conductivity effective mass that would otherwise occur.

71. A semiconductor device according to Claim 53 wherein said superlattice further comprises at least one type of conductivity dopant therein.